United States Department of Agriculture

Natural Resources Conservation Service

NNTC
Chester
Pennsylvania

NUTRIENT AND SEDIMENT CONTROL SYSTEM

INTRODUCTION

Agricultural and urban land uses contribute to nonpoint source pollution of lakes and streams resulting in impairments to fisheries, recreation, drinking water, irrigation water and aesthetic values.

Aquatic ecosystems can be damaged by even small amounts of pollutants. Nutrients, pesticides and sediments are recognized for having long-term adverse effects on lakes, streams and natural wetlands and their inhabitants.

In addition to the application of conventional conservation practices to avoid damage to sensitive aquatic ecosystems, there is a need to intercept and treat the runoff water that carries pollutants.

These systems can provide supplemental treatment of cropland runoff, urban runoff, barnyard runoff, milkhouse wastewater and aquacultural wastewater.

Nutrient and Sediment Control Systems (NSCS) are recognized for effectively reducing concentrations of pollutants from a variety of sources by intercepting and treating water.

Approximately 90 percent of total phosphorus and suspended solids can be removed by the NSCS system during storm events. Similar results can be expected for nitrogen removal.

GENERAL DESCRIPTION OF NSCS

The complete NSCS shows a combination of a sediment basin, grassed buffer, a vegetated shallow pond, a deep pond and a vegetated "polishing" area. *(See Plan View - Page 2)*

The components may be constructed together, as shown on the schematic to meet the site limitations. *(See Profile View - Page 3)*

The size of each system and its individual components are based on a review of the literature of on-site research activities, hydrologic models, site conditions and the degree of pollutant reduction.

The NSCS size, criteria and procedures used for planning purposes are designed to be simple and will apply for most field conditions encountered.

Where the landscape does not lend itself to geometric shapes, efforts should be made to design the components so that their shape and appearance blend with the surrounding landscape. This includes construction materials such as stone, fencing, vegetation and other ancillary materials.

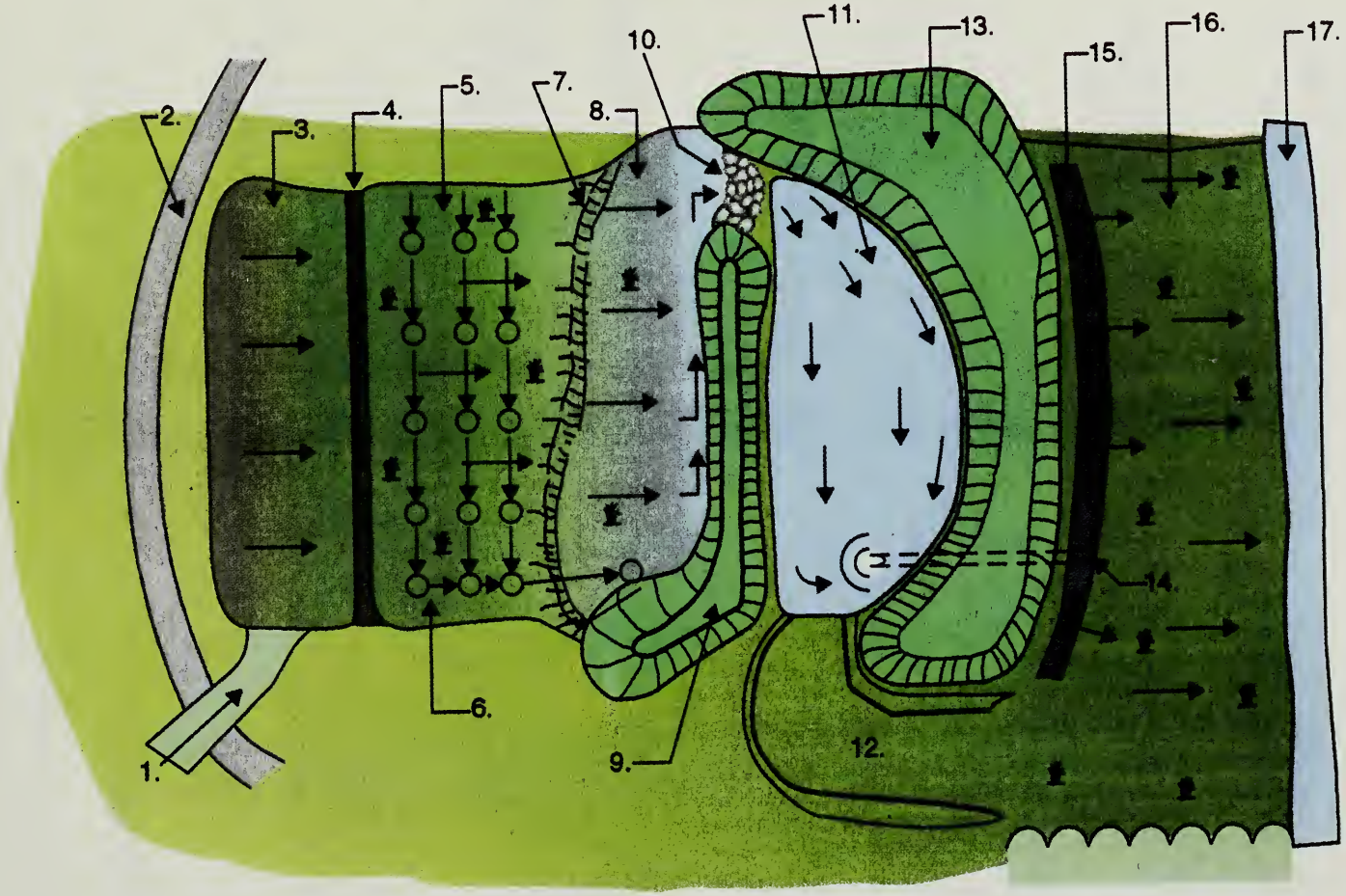
PLANNING AND SITE CONSIDERATIONS

The life expectancy of an NSCS is estimated at 20 to 30 years, based on proper operation and maintenance and adequate conservation treatments in the contributing area.

As a minimum, consider the following:

- A site survey is needed to determine the degree of risk to the groundwater when planning an NSCS.
- Consider safety features, such as fencing, when the NSCS is located near residential areas.
- Where possible, design the NSCS to avoid placement in valuable natural wetlands.

Plan View - Site Sensitive Design

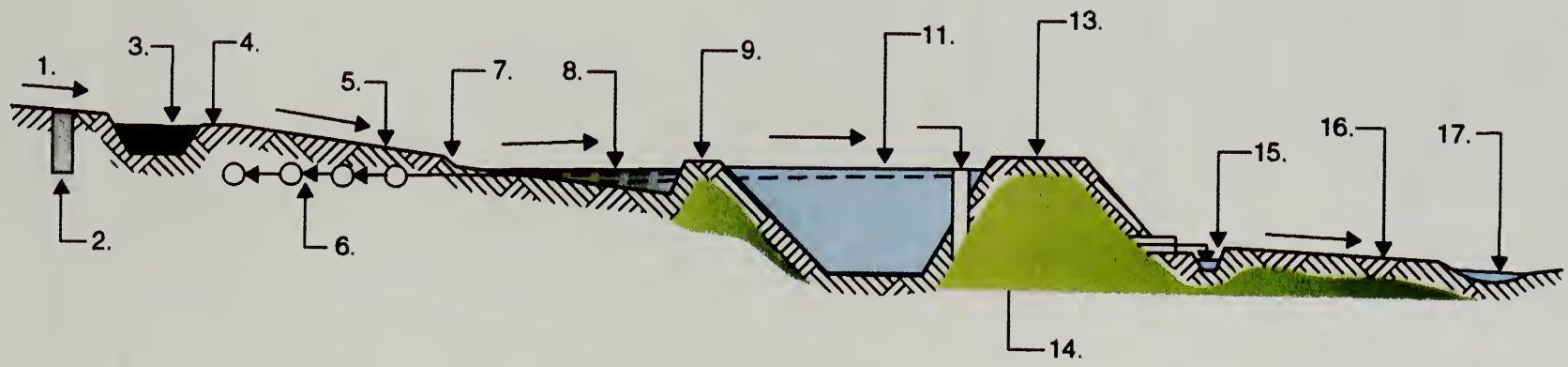


Legend

1. Contributing area to the NSCS
2. Curtain drain
3. Sediment basin
4. Level lip spreader
5. Grassed buffer
6. Subsurface drains
7. Transition zone
8. Vegetated shallow pond
9. Training dike
10. Stable outlet
11. Deep pond
12. Vegetated emergency spillway
13. Embankment
14. Principal spillway
15. Distribution spreader
16. Vegetated "polishing" area
17. Stable outlet

Not to scale

Profile View



Legend

1. Contributing area to the NSCS
2. Curtain drain
3. Sediment basin
4. Level lip spreader
5. Grassed buffer
6. Subsurface drains
7. Transition zone
8. Vegetated shallow pond
9. Training dike
10. Stable outlet (not shown)
11. Deep pond
12. Vegetated emergency spillway (not shown)
13. Embankment
14. Principal spillway
15. Distribution spreader
16. Vegetated "polishing" area
17. Stable outlet

Not to scale

- Federal, state and local laws, regulations and ordinances must be followed in the planning, design, construction and operation and maintenance of the NSCS.

COMPONENT DESCRIPTIONS OF THE NSCS

- **Contributing Area to the NSCS (Number 1).** The contributing area includes all land and associated conservation practices above the NSCS.

  The components of the NSCS are installed as needed to intercept surface water and groundwater to optimize NSCS effectiveness.

  Pass polluted runoff from the contributing area through the NSCS. The NSCS can help reduce shock loadings of pesticides to the receiving water.

- **Curtain Drain (Number 2).** This is a drain which intercepts the path of subsurface water flow and diverts it around the NSCS.

- **Sediment Basin (Number 3).** The sediment basin is designed to collect large sediment particles and organic matter from runoff water prior to routing it through the treatment system.

- **Level-Lip Spreader (Number 4).** This component insures the necessary sheet flow of water from the sediment basin to the grassed buffer.

- **Grassed Buffer (Number 5).** The grassed buffer is a filtering component which removes some suspended particles and nutrients and maintains an even water flow.

- **Subsurface Drains (Number 6).** A subsurface drain is constructed below the grassed buffer to:

  — Increase infiltration.
  — Maintain the grass root zone in an aerobic condition.
  — Prevent the area from being saturated for extended periods.
  — Facilitate mowing and removal of grass.

- **Transition Zone (Number 7).** A transition zone insures uniform sheet flow to the vegetated shallow pond and provides bank stabilization at the interface between the grassed buffer and the vegetated shallow pond.

- **Vegetated Shallow Pond (Number 8).** The vegetated shallow pond supports a combination of anaerobic and aerobic conditions in the soil and organic matter. These conditions are especially important in the removal of nitrates, ammonia and bacteria.

- **Training Dike (Number 9).** A training dike is installed between the vegetated shallow pond and the deep pond to avoid short circuiting of flow.

- **Stable Outlet (Number 10).** The purpose of the outlet is to provide a stable interface between the vegetated shallow pond and the deep pond.

- **Deep Pond (Number 11).** The deep pond with its plant and animal communities transforms pollutants into biomass through food chains.

- **Vegetated Emergency Spillway (Number 12).** This consists of a vegetated earthen channel, designed to discharge flow in excess of the principal spillway design discharge.

- **Embankment (Number 13).** This is a dam that confines water in the deep pond.

- **Principal Spillway (Number 14).** It serves to retard peak flows which increases water storage time for treatment of pollutants.

- **Distribution Spreader (Number 15).** A distribution spreader provides uniformly distributed flow from the principal spillway outlet to a vegetated "polishing" area.

- **Vegetated "Polishing" Area (Number 16) (optional).** The "polishing" area serves as a final buffer between the NSCS and the receiving water body.

- **Stable Outlet (Number 17).** A stable outlet is a structure or channel that is protected from excessive scour. It is used to control the discharge of water.

NSCS COST

NSCS construction costs have ranged from $10,000 to $50,000 per system depending on site conditions and geographic region.

OPERATION AND MAINTENANCE

General. Operation and maintenance is essential to ensure efficient operation for each NSCS installed. Examples include:

- Remove accumulated sediment from the sediment basin.

- Maintain the level lip spreader by raking or grading.

- Mow grassed buffer at least twice during the growing season.

- Maintain the subsurface drains in a free-flowing condition.

- Rake dense floating mats of filamentous algae from the deep pond.

For more information contact USDA, NRCS, 160 E. 7th Street, Chester, PA 19013-6092 and request a copy of "Environmental Quality Technical Note Number N4."